



# Ijar M. da Fonseca

Ph.D. Flight Mechanics, M.Sc. Aerodynamics and Flight Mechanics, Mechanical Engineers, and Bachelor History

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## Education

- Postdoctoral: [Howard University](#), Nov. 2001 - Jan. 2003
- Ph.D. Flight Mechanics

1998, Technological Institute of Aeronautics, [ITA](#), and Howard University - Shared Doctoral Program ITA (Brazil)/Howard University (USA)  
São José dos Campos, SP, Brazil

- M.Sc. in Orbital Dynamics and Flight Mechanics

1986, Technological Institute of Aeronautics, [ITA](#)  
São José dos Campos, SP, Brazil, 1986

- Mechanical Engineering

1981, Minas Instituto de Tecnologia, MG, Brazil, 1981

- Bachelor of History

1972, Minas Gerais Federal University, MG, Brazil, 1972

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## International Experience

- **United States**
  - Post Doctoral Research - Howard University, Nov. 2001 to Jan. 2003
  - Joint research together with Prof. [Peter M. Bainum](#) on Control Structural Interaction and Space Structure/Control Optimization, at [Howard University](#), Washington D.C., (1992-1994)

- Technical Meeting [JPL](#) , Pasadena, USA - participation in the Brazilian Scientific Application Satellite mission, [SACI-1](#) (1995) with a GPS experiment.
- **China**
  - Technical Meeting: Beijing, Xang Hai, Taiyuan Satellite Launching Center, TSLC, (1995 and 1997) to discuss the SACI-1 satellite to Long March launcher interface.
- **Japan**
  - Chairman of the g-5 session (Orbit Determination and Navigation) of the 18th International Symposium on Space, Technology and Science, Kagoshima, November 1991
  - Chairman of the C-3 session on structural dynamics and microdynamics, Fukuoka, October, 2005
- **The Netherlands**
  - Chairman of the IAC 2001 in Amsterdam
  - Technical Meetings to discuss the PMM development plan, hardware specification and SW development plan, Nordwijk, ESOC, 2004
- **France**
  - International Astronautical Congress IPC (International Program Committee) technical meetings in Paris, since 2003
- **Mexico**
  - [University of Puebla](#) : technical support for the Mexican satellite project, SATEX-1(1995)
  - Organizing Committee of the PueblaSat
- **Melbourne** (Australia), **Rio de Janeiro** (Brazil), **Amsterdam** (Holland), **Paris** and **Toulouse** (France), **Fukuoka** (Japan), **Valencia** (Spain), **Vancouver** (Canada): participation of the International Astronautical Congress (IAC) by presenting papers and serving as rapporteur and chairman of the Materials and structures Symposium.

### Space and other activities at INPE, Brazil

- Responsible for the Attitude Control Subsystem of the EQUARS satellite at INPE (2003-2005)
- Member of the satellite Multi Mission Platform, PMM, at INPE. Responsible for the onboard software planning and development. (2003 up to date).
- Spacecraft Attitude Dynamics and Control activities regarding the Brazilian satellites [SCD-1](#), [SCD-2](#) , [SSR-1](#), and [SACI-1](#) and [SACI-II](#), including separation dynamics studies (SCD1 and SACI-1) and recommendations for a spring separation system for the SCD1, September 1984-1998

- Responsible for the SACI satellites attitude control subsystem designs (including torque coils and a partially filled viscous ring nutation damper designs)
  - Member of the Space Mechanics and Control Division Graduation Council since 1998
  - Professor of Analytical Dynamics and Optimal Control since 1998 (Graduation)
  - Chair of the Council of the Space Mechanics and Control Course of the Engineering and Space Technology, 2008
  - PIBIC President at INPE, 1998-2000 (An undergraduation program for scientific research initiation, supported by the Brazilian National Council for Research Development, CNPq)
  - Member of the International Program Committee (IPC), Materials and Structures Symposium, International Astronautical Federation, IAF.
  - Presently: Control Software Specification (according to ESA SW engineering standards) for the Brazilian Platform Multi mission Satellite (PMM)
  - INPE Ad hoc commission to evaluate the RFI (Request For Information) aiming contracts of enterprise to provide the PMM ACDH subsystem (2007)
  - Assessor: Attitude Control Subsystem (ACS) development for the University of Paraná nanosatellite – UNOSAT (2007).
  - Assessor: FAPESP, a institution at São Paulo to support research in universities and research institutes in the State of São Paulo, Brazil.
  - Pointed to be the head of the Space Mechanics and Control Division at the Engineering and Technology Coordination of the Brazilian Institute for Space Research, June 2008
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### **Other Activities:**

Member of International Committee Program (IPC) of the Materials and Structure Symposium, International Astronautical Congress of the International Astronautical Federation

Correspondign Member of the International Academy of Astronautics (IAA) since 2006

Member of the study group for the 50th Anniversary of the Space Era Edition of the IAA Multilingual Space DictionaryMember (IAA SG6.10 Language Group)

### **Teaching Experience**

**Brazilian Institute for Space Research, [INPE](#), São Paulo, Brazil**

Graduation Courses - teaching

Analytical Dynamics, 1999-2008

Rigid Body Motion, 1991

Optimal Control 1998.

**São Judas University**, São Paulo City, SP, Brazil  
Graduation Course - teaching  
Mechatronics, 1998-2005

**Ibirapuera University**, [UNIB](#) São Paulo, SP, Brazil  
**Undergraduation Disciplines:**

**Computer Advanced Topics, 1998-2005**

**Operating Systems, 2003**

**Formal Languages and Automata 2004**

**Computer Theory 2004**

**University of São Marcos, São Paulo, SP, Brazil**  
**Undergraduation Disciplines (since 1998)**

**Software Engineering**

**Software Quality**

**Operating System**

**Information System Security and Audits**

**Director of the Long Distance E-Learning Program at the University of São Marcos, SP since 2007**

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## **Research**

- Howard University, USA, Nov. 2001 to Jan. 2003: Integrated Structural and Control Optimization Approach for a Large Space Station Design (**Post doctoral program** support by FAPESP. S.P., Brazil)
- Technological Institute of Aeronautics, [ITA](#) São José dos Campos, SP, Brazil, 1982-1984: **MSc.** on Attitude Dynamics of a Satellite with Flexible Appendages Subject to the Gravity Gradient. The research handled aspects of dynamics interaction between the spacecraft flexibility and its rigid body motion.
- Technological Institute of Aeronautics, [ITA](#) and [Howard University](#) : **shared Ph.D. program** in the area of flight dynamics with the research subject "Integrated Structural/Control Optimization of a Large Space

Structures with Articulation Subject to the Gravity-Gradient Torque".  
(1991-1997)

- Brazilian Institute for Space Research, [INPE](#), São José dos Campos, SP, Brazil, since 1984 participating in Brazilian and **International Conferences, Congresses and Symposia** with researches on attitude dynamics, control, programming and computer simulations.
  - Ph.D. Students: 3
  - Master Students: 6
  - Under graduation students enrolled in scientific initiation program: 2
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#### Main publications:

Ijar M. da Fonseca, Paulo Moraes Jr., and Narumi Seito; Connecting in Space-Space Tugs, 6<sup>o</sup> Brazilian Conference on Dynamics, Control and Their Applications, May 21-25, 2007 (DINCON'2007), IBILCE-UNESP, S. J. Rio Preto, SP, Brazil, ISBN: 978-85-85769-32-1, pp. 118-128

Ijar M. da Fonseca, Peter M. Bainum, and Adenilson R. da Silva; LSS Vibrational/Rotational Control by Using Sensors and Actuators Models in the Computer Simulations, Paper IAC-07-C2.3.03, 58<sup>th</sup> International Astronautical Congress, Hyderabad, India, 24-28 September 2007

Ijar M. da Fonseca; Peter M. Bainum, Adenilson R. da Silva; Structural control interaction for an LSS attitude control system using thrusters and reaction wheels, ACTA ASTRONAUTICA, vol. 60, 10-11, May-June 2007, ISSN0094-5785, pp. 865-872

Antônio C. Morato and Ijar M. da Fonseca; Private Enterprise Liability for Space Servicing, Paper IAC-07-E6.2.05, 58<sup>th</sup> International Astronautical Congress, Hyderabad, India, 24-28 September 2007

Narumi Seito and Ijar M. da Fonseca, SARA Orbital Autonomous Rendezvous and Docking a Scientific and Technological Challenge, 6<sup>o</sup> Brazilian Conference on Dynamics, Control and Their Applications, May 21-25, 2007 (DINCON'2007), IBILCE-UNESP, S. J. Rio Preto, SP, Brazil, ISBN: 978-85-85769-32-1, pp. 485-490

I.M. da Fonseca, et al., Structural control interaction for an LSS attitude control system using thrusters and reaction wheels, Acta Astronautica (2006), doi:[10.1016/j.actaastro.2006.11.008](https://doi.org/10.1016/j.actaastro.2006.11.008)

*Ijar M. Fonseca and Peter M. Bainum*, The Brazilian Satellite Program – A Survey, The Malcolm D. Shuster Astronautics Symposium, Proceedings of the University at Buffalo, State University of New York / AAS Malcolm

D. Shuster Astronautics Symposium held June 12-15, 2005, Grand Island, New York, 2006, Eds. John L. Crassidis, F. Landis Markley, John L. Junkins & Kathleen C. Howell, pp. 507-532 Hard Cover, ISBN 0-87703-525-3; Soft Cover, ISBN 0-87703-526-7

Ijar M. Fonseca, Peter M. Bainum; Integrated Structural and Control Optimization, *Journal of Vibration and Control*, 10: 1377-1391, 2004

Ijar M. Fonseca, Marcelo C. Santos, and Peter M. Bainum; CPU Time Consideration for LSS Structural/Control Optimization Models with Different Degrees of Freedom, *Acta Astronautica* 54 (2004), 259-266

Ijar M. Fonseca and Peter M. Bainum; On the Dynamics and Control of Space Station Robotic Manipulators, DINCON – SBMAC, ISBN 85-86883-15-8, 2003

Ijar M. Fonseca and Peter M. Bainum; Integrated Structural Control Optimization of a Large Space Structure with a Robot Arm by Using a Semi-Analytical Approach, to appear in the Commemorative Issue of *Journal of Vibration and Control* honoring Professor Vinod Modi, 2003

Ijar M. Fonseca, Peter M. Bainum, and Paulo T. M. Lourenção; Structural and Control Optimization of a Space Structure Subjected to the Gravity-Gradient Torque, *Acta Astronautica*, vol. 51, No. 10, pp.673-681, 2002

Ijar M. Fonseca and Marcelo C. Santos; SACI-2 Attitude Control Subsystem, in *Advances in Space Dynamics*, Edited by O. Winter and A. F. B. A Prado, Vol. 3, pp. 197-209, INPE, S.J. Campos, SP, Brasil, 2.002

Ijar M. Fonseca and Peter M. Bainum, Large Space Structure Integrated Structural and Control Optimization, Using Analytical Sensitivity analysis, *Journal of Guidance, Control, and Dynamics*, Vol. 24, No. 5, September-October, 2001, pp. 978-982

Ijar M. Fonseca and Peter M. Bainum, Integrated Structural/Control Optimization of a Large Space Structure with Articulation, in *Advances in Space Dynamics*, Edited by Antônio Fernando Bertachini de Almeida Prado, S.J. Campos, SP, Brazil, 2.000, pp 380-392

Fonseca, I.M. and Bainum, P.M.; Simultaneous structural and control optimization of large space structures, *Applied Mechanical Reviews*, Vol. 48, Number 11, Part 2, Nov. 1995, pp S175-S180.

Ijar M. Fonseca, José A. C. F. Neri, Milton Souza Ribeiro; After- Separation Attitude Dynamics of the Brazilian Satellite SACI-2, *RBCM, J. of the Braz. Soc. Mechanical Sciences*, Vol. XXI, Special Issue, 1999, pp 156-163.

Fonseca, I. M.; Souza, P. N.; Neri, J. F. C.; Guedes, U. T. V., Attitude dynamics and Control of the Brazilian Scientific Application Satellite – SACI-1. In: *ESA International Conference On Spacecraft, Guidance Navigation and Control Systems 3.*, Noordwijk, Nov. 1996. Proceedings. Noordwijk, ESTEC, 1996. (ESA SP-381)

Neri, J.A.C.F, Dos Santos, W.A., Rabay, S., Fonseca, I.M, et al; The Brazilian Scientific Microsatellite SACI-1, Acta Astronautica, Vol. 30, No. 9-12, November- December, 1996, ISSN 0094-5765.

Fonseca, I.M. and Ribeiro, J.F.; On The Dynamics and Control of the First Brazilian Remote Sensing Satellite, ESA SP-323, pp. 585-588, June, 1991

Fonseca, I.M. e Souza, P.N.; Corpo Rígido Dotado de um Amortecedor de Nutação Anular Viscoso e Sua Validação Experimental, Revista Brasileira de Ciências Mecânicas, Vol XII, páginas 89-111, 1.990.

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### **Interests - personal**

Travel, fishing, reading, space, computers, and History.

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## **Contact Information**

Brazilian Institute for Space Research - INPE  
Space Mechanics and Control Division - DMC  
Av. Astronautas, 1758 , P.O. Box 515  
12223-010 São José dos Campos, SP

55-12-3945 6189 (office)  
55-12-3949 2345 (home) and Cel. 55-12-81239319  
55-12 -3945 6226 (fax, office)

E-mail: [Ijar@dem.inpe.br](mailto:Ijar@dem.inpe.br), Home Page: [Ijar Home Page](#)